NOTE.

In his review of my "Money and Prices" in the March number of the QUARTERLY PUBLICATIONS, Professor Warren M. Persons makes several serious errors. In the first place, he confuses the arithmetic operations of addition and multiplication in a most surprising way. I had criticized the Pearsonian Coefficient of Correlation as a means for testing the relationship between two series of index numbers, because the coefficient is not changed if a constant is added or subtracted from each term of one (or both) series. Professor Persons admits the fact, but claims that it is an advantage for the Pearsonian Coefficient. He says that it is analogous to moving a curve of index numbers up or down to facilitate comparison. He seems to forget that moving a curve up or down or adding or subtracting a constant from a series of index numbers changes the relationship expressed. We must remember the significance of index numbers. Let us take a series of quantities represented by the index numbers in Column A.

	COLUMN A.	COLUMN B.
1900	100	60
1901	90	50
1902	110	70

The series means that the ratio of the quantity for 1901 to the quantity for 1900 is 90:100 or $\frac{9}{10}$; that the ratio of the quantity for 1902 to the quantity for 1901 is 110:90 or $\frac{11}{9}$. If we subtract 40 from each index number, we get the index numbers in Column B. Now the ratio of the quantity for 1901 to the quantity for 1900 is $\frac{5}{6}$ which is obviously not the same as $\frac{9}{10}$; and the ratio of the quantity for 1902 to that of 1901 is $\frac{7}{5}$ which is obviously not the same as $\frac{11}{9}$. If this fundamental point is grasped the objection to the Pearsonian Coefficient may be stated again. The Pearsonian Coefficient gives perfect correlation when there is a constant difference between the two series of index numbers as well as when there is a constant ratio between the two series. As was shown above, two series of index numbers with a constant difference between them do not display the same relative changes. Professor Persons surely knows the proper method of bringing curves representing index numbers closer for purposes of comparison. Each ordinate of one curve may be multiplied by a constant multiplier, since multiplying both terms of the ratio by the same number does not change the value of the ratio.

Moreover, the above objection applies not only to the ordinary form of the Pearsonian Coefficient of Correlation but also to the modification which Professor Persons intimates might well have been used, namely, Hooker's method. Therefore the use of the method is inadvisable, although it does consider the order in time of the items of the series. Hooker's method uses the differences between the successive items of the series in place of the differences between the items and the mean, in the computation of the coefficient. It is clear that the differences between the successive items of the series would not be changed if a constant were added to or subtracted from each term of the series. So, here again, the coefficient may give incorrect results.

Professor Persons has criticized the Degree of Correspondence without taking the trouble to understand how it is computed and the underlying assumptions. In the first place, the Degree of Correspondence was devised primarily to be used with index numbers. Bearing in mind the nature of index numbers, it seems reasonable to hold that there is perfect correspondence between two series of index numbers if they both move in the same direction and the relative amounts of change are the same. One form of the Degree of Correspondence was used in which account was taken only of the direction of the change and another form (used only in testing the proofs of the Quantity Theory of Money) where both the direction and the amount of the change were considered. This latter form Professor Persons computed incorrectly in his examples. The operation which he describes of making the first terms of the two series equal must be repeated for each pair of terms of the series, and not be done just once for the whole series. Again, the examples by which Professor Persons seeks to show that the Degree of Correspondence is erratic, simply show that he has a different definition of perfect correspondence. He gives series in arithmetic progression or where the absolute changes in one are a given number of times the changes in the other, while, as was shown, the Degree of Correspondence is based on the idea that perfect correspondence means equal relative changes. Professor Persons's idea of perfect correspondence seems to be merely that the relationship between the two series shall be expressible in an algebraic equation of the first degree. He has, of course, as good a right as anyone to make a definition of perfect correspondence. But it is hardly fair to call the Degree of Correspondence, based on another idea of perfect correspondence, erratic, simply because it does not fit his definition. In the case of all the examples given on page 81 of the review, the Degree of Correspondence for the direction of the change would be +1, since the direction of the movement is the same throughout. If, however, we consider the amount of the change as well as its direction, the Degree of Correspondence for the first series is +.65, for the second is +.12, and for the third is +.21. These varying results show that the amounts of the relative changes are different and not that the Degree of Correspondence is erratic.

Professor Persons's point about the relation of the Degree of Correspondence to the growth element or trend is not clear. Would he have us believe that there is no correspondence between two series because the similarity is imputed to like growth elements? Moreover the Degree of Correspondence can be used to test the correspondence between the trends of two series or the deviations from the trends of the series.

The flippant inquiry as to whether the circulation is increased by drinking alcoholic beverages or vice versa, appears gratuitous. Exactly the same problem of which is cause and which is effect or whether there is any causal relationship would arise if one used the Pearsonian Coefficient of Correlation.

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